

REMARKS

The Examiner is thanked for the careful examination of this application. Claims 11, 12 and 14-21 are currently pending.

Rejections under 35 U.S.C. 112

The Examiner rejected claims 11, 12 and 14-21 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. Applicant respectfully traverses. However, solely for the purpose of expediting the prosecution of this application, claim 11 has been amended to address the Examiner's comments. Applicant respectfully requests that the rejection of claims 11, 12 and 14-21 under 35 U.S.C. 112, first paragraph, be withdrawn.

Rejections under 35 U.S.C. 103

Claims 11, 12 and 14-21 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lever Brothers & Unilever Limited (GB 612,667), hereafter "Lever", in view of Sucher & Holzer Bauplan Handel (AT 406870B), hereafter "Sucher", in view of Peter et al. (WO03/004591; US 6,933,398), hereafter "Peter", and further in view of Peterson et al. (JAOCs, Vol. 61, 1984), hereafter "Peterson." Applicant respectfully traverses for at least the reasons set forth below.

Comparison of Refluxing Methods

In the cited art, as exemplified by Sucher and Peter, glycerine and crude alkyl ester in the reactants are separated and refined by transesterification and thereafter, methyl ester is refluxed. *See*, for example, the Abstract of Sucher and col. 3, lines 57 to 66 of Peter. In contrast, with Applicant's process, the product comprising alkyl ester is

transesterified in a reactor (14) and is directly refluxed prior to going through the glycerine/ester separator (15). See, for example, Applicant's Fig. 3, reproduced below:

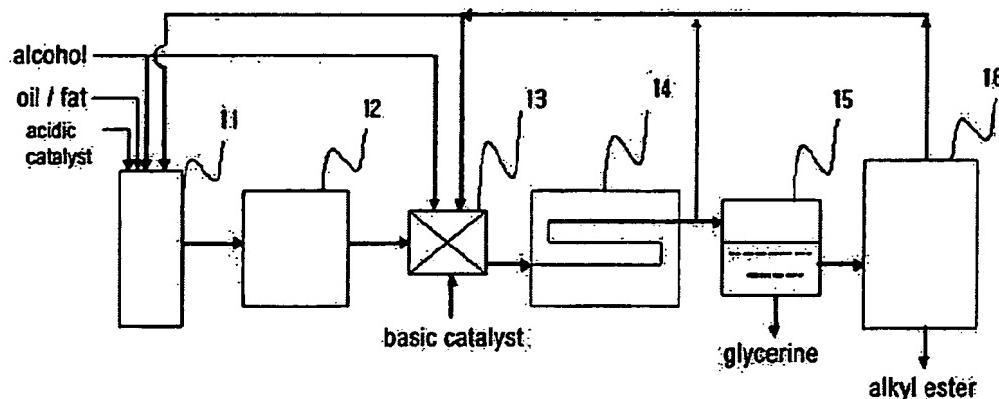


Fig. 3

Therefore, Applicant's process refluxes alkyl ester and glycerine along with non-reacted tri-, di-, mono-glyceride before the separating process, unlike the processes described in the cited art in which the methyl ester is separated and refined before being refluxed.

Applicant's process has clear advantages over the methods disclosed in the cited art and therefore cannot be said to be obvious in view of the cited art. For example, while Peter initially increases production speed by refluxing only fatty acid methyl esters (to increase the initial reaction rate of alcohol and oil) after separating and refining the reaction products, this shifts the reaction equilibrium in the reverse reaction direction by affecting the reaction balance. Therefore, although initial production speed increases, a reflux method as described by Peter is disadvantageous in that the purity of the produced methyl ester will be lower than that produced by Applicant's process. Furthermore, while the initial reaction rate may be increased with Peter's process, the reaction speed will slow as the reaction progresses, requiring a relatively larger transesterification reactor in compensation. As such, processes such as those described in the cited art lead to a decreased efficiency in the biodiesel production process as compared to Applicant's process.

Production of Free Fatty Acid Content

The cited art requires highly refined oil with low free fatty acid content for the reaction. For example, Peter uses highly refined oil in which the free fatty acid content is less than 0.5 wt%, preferably less than 0.1 wt%. *See*, for example, Peter col. 3, lines 49-52. In contrast, Applicant's method esterifies the free fatty acid with alcohol at the during a pre-treatment reaction without regards to the free fatty acid content and then converts and removes the free fatty acids before the transesterification reaction with the oil and alcohol. In consequence, Applicant's method is operable not only during a pre-treatment (*e.g.* esterification) reaction but also during a transesterification reaction as a main reaction for biodiesel production. This is clearly advantageous over the teachings of the cited art.

Reflux of Alkanol Fatty Acid Esters

The cited art requires a relatively large amount of refined methyl ester to be refluxed. For example, in Peter, 5-50% of the alkanol fatty acid esters are refluxed (*see*, for example, Peter, col. 3, lines 19- 21) along with a large amount of methyl ester (*see*, for example, col. 4, "Working Examples" 1-3). This influences the reaction balance as noted above, reducing the efficiency of the process and thereby increasing equipment and operating costs as compared to Applicant's methods.

Conclusion

In view of the foregoing, it is clear that claim 11 is not obvious in view of the cited art and, therefore, is patentable over the cited art. Applicant further respectfully submits that dependent claims 12 and 14-21 are patentable for at least the same reasons as set forth with respect to claim 11. Applicant respectfully requests that the rejection of claims 11, 12 and 14-21 under 35 U.S.C. 103(a) be withdrawn.

All claims being allowable, Applicant respectfully requests an early Notice of Allowance. The undersigned can be reached at the telephone number set out below and welcomes a call from the Examiner at any time to further expedite prosecution.

Respectfully submitted,



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